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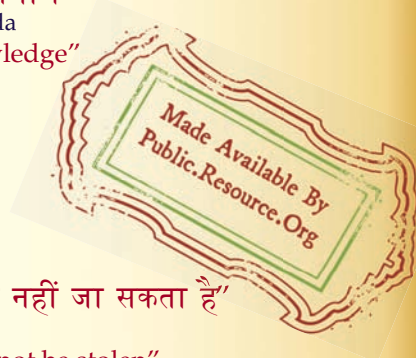
IS 10462-1 (1983): Fictitious Calculation Method for Determination of Dimensions of Protective Coverings of Cables, Part I: Elastomeric and Thermoplastic Insulated Cables [ETD 9: Power Cables]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS : 10462 (Part I) - 1983

(Reaffirmed 2001)

Indian Standard

FICTITIOUS CALCULATION METHOD FOR DETERMINATION OF DIMENSIONS OF PROTECTIVE COVERINGS OF CABLES

PART I ELASTOMERIC AND THERMOPLASTIC INSULATED CABLES

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

*Indian Standard*FICTITIOUS CALCULATION METHOD FOR
DETERMINATION OF DIMENSIONS OF
PROTECTIVE COVERINGS OF CABLES**PART I ELASTOMERIC AND THERMOPLASTIC
INSULATED CABLES**

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Indian Standard

FICTITIOUS CALCULATION METHOD FOR DETERMINATION OF DIMENSIONS OF PROTECTIVE COVERINGS OF CABLES

PART I ELASTOMERIC AND THERMOPLASTIC INSULATED CABLES

0. FOREWORD

0.1 This Indian Standard (Part I) was adopted by the Indian Standards Institution on 24 February 1983, after the draft finalized by the Power Cables Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 Indian Standards on cables specify some of the parameters such as inner and outer sheath thickness and armour size on the basis of calculated nominal cable diameters which are not necessarily the same as actual values achieved in production. In borderline cases, queries can arise if any of these parameters does not correspond to the actual diameter because calculated diameter may be slightly different.

0.3 To avoid variation in shaped conductor dimensions and method of calculation from manufacturer to manufacturer, the fictitious calculation method has been invented. The idea is to ignore the shape and degree of compactness of conductors and to calculate fictitious diameters from formulae based on the cross-sectional area of conductor, insulation thickness and number of cores. Various parameters which are independent of slight difference in manufacturing practices are then related to fictitious diameters by formulae or by tables. This method helps in standardizing cable designs, different parameters being pre-calculated and specified for each size of cables.

0.4 The fictitious calculation is used only to determine dimensions of sheaths and cable coverings. It is not a replacement for the calculation of normal diameters required for practical purposes, which should be calculated separately.

0.5 The details regarding fictitious calculations for paper insulated cables will be covered in Part II of the standard.

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0.6 In preparing this standard, assistance has been derived from IEC Publication 502 (1978) 'Extruded solid dielectric insulated power cables for rated voltages from 1 kV up to 30 kV', issued by the International Electrotechnical Commission (IEC).

0.7 The calculated value of fictitious diameter at each stage shall be rounded off to one significant place of decimal, that is, 0.1 mm, before proceeding to next step. The rounding off shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard (Part I) covers the fictitious calculation method of determination of dimensions of protective coverings of elastomeric (including cross-linked polyethylene) and thermoplastic insulated cables.

2. SYMBOLS

2.1 The symbols used in this standard and the quantities denoted by them are as given below:

d_L = Fictitious diameter of conductor

D_C = Fictitious diameter of core (in case of $3\frac{1}{2}$ cores, full core is denoted by D_{C1} and half core by D_{C2})

t_1 = Nominal thickness of insulation

D_I = Fictitious diameter over laid up cores

t_B = Inner sheath thickness

D_B = Fictitious diameter over inner sheath (this is also the fictitious diameter under the armour)

t_A = Diameter of armour wire or thickness of strip

D_X = Fictitious diameter over the armour

3. METHOD OF CALCULATION

3.1 Conductors — The fictitious diameter (d_L) of a conductor, irrespective of shape or compactness, is given for each nominal cross-section in Tables 1 and 2 for conductors in cables for fixed installations and flexible cables respectively.

*Rules for rounding off numerical values (revised).

**TABLE 1 FICTITIOUS DIAMETER OF CONDUCTOR IN CABLES
FOR FIXED INSTALLATIONS**

(Clause 3.1)

NOMINAL CROSS- SECTIONAL AREA OF CONDUCTOR	d_L	NOMINAL CROSS- SECTIONAL AREA OF CONDUCTOR	d_L
(1)	(2)	(1)	(2)
mm ²	mm	mm ²	mm
1.5	1.4	95	11.0
2.5	1.8	120	12.4
4	2.3	150	13.8
6	2.8	185	15.3
10	3.6	240	17.5
16	4.5	300	19.5
25	5.6	400	22.6
35	6.7	500	25.2
50	8.0	630	28.3
70	9.4	800	31.9
		1 000	35.7

TABLE 2 FICTITIOUS DIAMETER OF CONDUCTOR IN FLEXIBLE CABLES

(Clause 3.1)

NOMINAL CROSS- SECTIONAL AREA OF CONDUCTOR	d_L	NOMINAL CROSS- SECTIONAL AREA OF CONDUCTOR	d_L
(1)	(2)	(1)	(2)
mm ²	mm	mm ²	mm
0.5	0.9	50	10.3
0.75	1.1	70	12.4
1	1.3	95	14.5
1.5	1.6	120	16.0
2.5	2.0	150	18.0
4	2.6	185	20.0
6	3.6	240	23.0
10	4.6	300	26.0
16	5.7	400	30.0
25	7.1	500	33.5
35	8.5	630	37.0

3.2 Cores — The fictitious diameter, D_c , of any core is given by:

a) for unscreened cores:

$$D_c = d_L + 2 t_1 \text{ mm}$$

b) for cables of rated voltage requiring screening, to allow for semi-conducting layers with and without metallic screen:

$$D_c = d_L + 2 t_1 + 3.0 \text{ mm}$$

where t_1 is the nominal thickness of insulation (in mm) as given in individual cable specification.

3.3 Diameter Over Laid-Up Cores — The fictitious diameter over laid-up cores, D_f , is given by the following:

a) For cables having all cores of the same fictitious diameter:

$$D_f = k D_c \text{ mm}$$

where the coefficient k is as given in Table 3.

b) For $3\frac{1}{2}$ core cables:

$$D_f = \frac{2.42 (3 D_{c1} + D_{c2})}{4} \text{ mm}$$

where

D_{c1} = fictitious diameter of full (main) core, including metallic layer, if any; and

D_{c2} = fictitious diameter of half core (core having reduced neutral conductor).

c) For cables with cradle separator:

$$D_f = k (D_c + 2.5) - 2.5 \text{ mm}$$

where the coefficient k is as given in Table 3.

3.4 Inner Sheath — The fictitious diameter over the inner sheath, D_B , is given by:

$$D_B = D_f + 2 t_B \text{ mm}$$

where

t_B = thickness of inner sheath (in mm) as specified in individual cable specification.

TABLE 3 ASSEMBLY COEFFICIENT FOR CALCULATION OF FICTITIOUS DIAMETER OVER LAID-UP CORES

(Clause 3.3)

NUMBER OF CORES	ASSEMBLY COEFFICIENT <i>k</i>	NUMBER OF CORES	ASSEMBLY COEFFICIENT <i>k</i>
(1)	(2)	(1)	(2)
2	2.00	25	6.00
3	2.16	26	6.00
4	2.42	27	6.15
5	2.70	28	6.41
6	3.00	29	6.41
7	3.00	30	6.41
7*	3.35	31	6.70
8	3.45	32	6.70
8*	3.66	33	6.70
9	3.80	34	7.00
9*	4.00	35	7.00
10	4.00	36	7.00
10*	4.40	37	7.00
11	4.00	38	7.33
12	4.16	39	7.33
12*	5.00	40	7.33
13	4.41	41	7.67
14	4.41	42	7.67
15	4.70	43	7.67
16	4.70	44	8.00
17	5.00	45	8.00
18	5.00	46	8.00
18*	7.00	47	8.00
19	5.00	48	8.15
20	5.33	52	8.41
21	5.33	61	9.00
22	5.67		
23	5.67		
24	6.00		

*Cores assembled in one layer.

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3.5 Armour — The fictitious diameter over the armour, D_x , is given by:

$$D_x = D_B + 2 t_A \text{ mm}$$

where

t_A = diameter of the armour wire or thickness of strip (in mm) as specified in individual cable specification.

NOTE — In case of pliable wire armoured cables, t_A refers to the diameter of stranded armour, which is taken to be equal to 3 times diameter of individual armour wire.